

# Faith-based perspectives on the use of chimeric organisms for medical research

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**Abstract** Efforts to advance our understanding of neurodegenerative diseases involve the creation chimeric organisms from human neural stem cells and primate embryos—known as prenatal chimeras. The existence of potential mentally complex beings with human and non-human neural apparatus raises fundamental questions as to the ethical permissibility of chimeric research and the moral status of the creatures it creates. Even as bioethicists find fewer reasons to be troubled by most types of chimeric organisms, social attitudes towards the non-human world are often influenced by religious beliefs. In this paper scholars representing eight major religious traditions provide a brief commentary on a hypothetical case concerning the development and use of prenatal human–animal chimeric primates in medical research. These commentaries reflect the plurality and complexity within and between religious discourses of our relationships with other species. Views on the moral status and permissibility of research on neural human animal chimeras vary. The authors provide an introduction to those who seek a better

understanding of how faith-based perspectives might enter into biomedical ethics and public discourse towards forms of biomedical research that involves chimeric organisms.

**Keywords** Chimeric organisms · Animal experimentation · Religion · Bioethics

## Introduction

Many types of chimeric organisms are not morally controversial—humans with transplanted pig heart valves and blood group chimerism in non-identical twins and triplets invite no scientific or moral contest (Greely 2003; Robert 2006). However the same cannot be said for the types of interspecies chimeras created through the introduction of human embryonic stem cells into a non-human embryo or fetus (Streiffer 2005). At the cellular level these creatures are mosaics such that “individual cells are derived from either the host or the donor but not both.” (Baylis and Robert 2007, 41) The reasons for developing this type of creature are both evidentiary and therapeutic. In the first instance the hope is that the ‘human’ attributes of human–animal chimeras will make them a better model for biomedical research that seeks to understand and treat human disease. The second potential benefit is that animals with human immune systems might, potentially,

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With Commentaries by: Zhen Cai, John Berkman, Elliot Dorff, Lisa Kemmerer, Anna King, Andrew Linzey, Karen Swallow Prior and Sarra Tlili

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provide a source of compatible tissues for xeno transplantation (Robert 2006). While the true scientific and therapeutic value of research involving engrafted embryonic chimeras remains an open question, regulatory authorities, concerned scientists and animal advocates have felt impelled to establish legal obstacles to its practice (Baylis and Robert 2007; Sherringham 2008).

Much of the concern has surrounded the development of prenatal chimeras from human neural stem cells in primate embryos (Greene et al. 2005). Even if it is a remote possibility that a being created through this process would have enhanced or ‘human-like’ cognitive or psychological characteristics, the ‘unnaturalness’ of human–animal chimeras makes many people uncomfortable eliciting a visceral reaction against their creation (HFEA 2007; Jones 2009). Biomedical ethicists and moral philosophers have responded by interrogating arguments for and against chimeric research based on premises such as: the potential for harm to the creatures created for research (Streiffer 2005); the value of species integrity and the possible risk these creatures pose to human dignity (DeGrazia 2007; Karpowicz et al. 2004; Melo-Martín 2008), and the potential harms of violating natural, legal and social categories (Eberl and Ballard 2009; Haber and Benham 2012; Robert and Baylis 2003).<sup>1</sup> These arguments can be respectively and loosely categorized as raising objections on the basis of concern for: the welfare of research participants; the integrity of natural processes; and, the broader social consequences of permitting chimeric research practices.

Although there is by no means an absolute consensus,<sup>2</sup> many bioethicists and philosophers now hold the view that the biological humanisation of another species of animal poses no particular moral problem; and that moral humanisation is unlikely, but should it occur to the point of borderline personhood, then this would constitute a moral wrong (Streiffer

2011). Even so the issues surrounding the use of humanised chimeric organisms extend well beyond their intrinsic value and putative moral status. It has been claimed that Western discomfort with chimeric research—more broadly—is a barrier to the efficient and rapid development of vaccines and cost effective treatments for diseases such as HIV, Malaria and dengue—neglected diseases that disproportionately effect the developing world (Bhan et al. 2010).

Against this background, it seems that in Western societies such as the UK and US, public attitudes on the rights and wrongs of research involving human–animal chimeras remain divided (Jones 2009; Office of Technology Assessment 1987). A significant number of people are of faith and theologians are often the first to consider the normative implications of biotechnological developments. It has therefore long been acknowledged in the UK, USA, and many other places in the world, that religious traditions should contribute towards framing the regulation of novel forms of biomedical research and clinical practice.<sup>3</sup> Religious discourses offer concepts and structures through which to understand our relationship with other species, our place in nature, and tell us what our obligations to other forms of life should be. Even as the involvement of religious scholars in public debates about new technologies has a long and fruitful tradition, to date there has been little public discussion of religious positions on the moral permissibility of chimeric research, or indeed about how faith based perspectives might influence public attitudes towards its practice.<sup>4</sup> To this end, we solicited commentaries on a hypothetical case (see

<sup>1</sup> Unfortunately space does not permit a detailed description of these different arguments. For a review of the development and regulatory impact of Bioethical positions on research involving chimeric organisms see: (Baylis and Robert 2007) and (Harvey and Salter 2012)

<sup>2</sup> See for example: Midgley (2000)

<sup>3</sup> Regulatory jurisdictions in which faith-based positions on research involving chimeric organisms have been submitted to statutory bodies include the United Kingdom and Singapore. See for example: The Church of Scotland (2005) Reponse on the review of the Human Fertilisation and Embryology Act. Church and Society Council and the Science Religion and Technology Project; Catholic Bishops’ Conference of England and Wales. (2007) Catholic Bishops’ Conference of England and Wales and Linacre Centre for Healthcare Ethics Joint Response to the Human Tissue and Embryos, Mission and Public Affairs Council (2010) Response to the Academy of Medical Sciences’ Call for Evidence: ‘Animals Containing Human Material’. Church of England; and, The Bioethics Advisory Committee. (2010) Human–animal Combinations in Stem Cell Research. Singapore.

<sup>4</sup> This is not the case with research involving transgenesis and genetically modified organisms. See for example: (Bruce and Bruce 1998) and (Brunk and Coward 2009)

below) from scholars representing eight major religious traditions.

### Hypothetical case

David is a technician in a medical research facility. Part of David's daily work involves the creation of, and care for, the human–animal chimeras employed in the laboratory's program of experimentation. (Interspecies chimeras are creatures that result from the introduction of genes, cellular material or body parts from one species into another different species. Most commonly, non-human animals are 'humanised' through the introduction of human genes, in order to facilitate research on human disease models or to generate specific biological products or therapies.)

David's research group has recently begun a series of investigations into Alzheimer's disease and David has been asked to develop a new type of primate model to help explore the pathological processes underlying the human disease. The procedure involves the injection of increasingly large doses of human neural (brain) stem cells into macaque embryos. The aim is to find the 'dose' that reliably produces a network of functional human neurons in a standardised nonhuman animal model. The ethics approval under which this research is being undertaken stipulates that the resulting chimeras must have no more than 10 % human neural tissue.

David finds these developments to be particularly troubling. Although he believes that this research has enormous potential, he is concerned about whether it is 'right' to introduce functional human brain (stem) cells into the brains of other species—and whether through this process the laboratory animals somehow become 'more human'. He also feels unsure as to whether 'humanising' these macaque means that they should be treated differently while they are alive and that they should not (as easily) be destroyed.

Contributors were called upon to provide first person interpretations of what they took to be the 'most salient issues' confronting the central character. David's story explicitly and implicitly asked contributors to be prescriptive in the sense that it steers them to make judgments or construct ways of seeing animal experimentation as right or wrong and offer recommendations. Our contributors responded with public moral statements grounded in different faith traditions. The commentaries do not attempt to exhaustively survey the relevant discourse or views within these traditions, and other members of these traditions may well draw alternative conclusions from the same or different authoritative sources. The commentaries do, however, offer the considered responses of leading experts from each religious tradition and each are grounded in the key texts and

in scholarly and popular interpretations of the respective doctrines.

### An Anglican perspective

The Revd Professor Andrew Linzey is an Anglican priest, a member of the Faculty of Theology in the University of Oxford, and Director of the Oxford Centre for Animal Ethics ([www.oxfordanimaethics.com](http://www.oxfordanimaethics.com)). His 20 books include *Animal Theology* (SCM Press/University of Illinois Press, 1994) and *Why Animal Suffering Matters* (Oxford University Press 2009).

The Anglican Communion is a collection of autonomous churches all holding some allegiance to the historic See of Canterbury. Anglican churches are typically both catholic and reformed. There is no centralised teaching authority and Anglicanism prides itself on being a "broad church". Resolutions of the Lambeth Conference of Anglican bishops, held every 10 years, have only advisory status and each province or country has its own autonomous synod of bishops, clergy and laity. Therefore, one will find a wide diversity of belief and practice within Anglicanism. There is no *one* Anglican view on animal experiments as there is no one view on capital punishment, same-sex relations, abortion or environmental issues. The consensus on all these issues has changed and is continually changing.

That said, experimentation on animals, or "vivisection" as it was historically known, has been a particular source of controversy since its emergence in Britain in the nineteenth century. Notable Anglicans, such as Lord Shaftesbury, John Ruskin, Edward King, Lewis Carroll (Charles L. Dodgson), William Thompson (Archbishop of York), Marcus Beresford (Primate of Ireland) and numerous bishops opposed the practice. In 1880, Baron Ernst von Weber said that the anti-vivisection movement had grown so quickly in England because of "the religious tendency of the English nation" and "the warm support of the ... clergy". The chief theological objection was that cruelty was incompatible with Christian life—an idea which also gave rise to the establishment of the first national anti-cruelty organisation in the world, the Royal Society for the Prevention of Cruelty to Animals in 1824, founded by the Anglican priest Arthur Broome.

But with the passing of the 1876 Cruelty to Animals Act, which established and sought to regulate experimentation, Anglicans came gradually to accept the practice, as witnessed by the support of 16 bishops who became vice-presidents of the Research Defence Society (the leading pro-vivisection society) in 1911. They argued that research on animals was justifiable if it leads to cures for human diseases.

Disagreement, however, about how far scientific procedures can be justified has continued to characterise Anglican moral theology to the present day. C. S. Lewis (1947) famously argued in his pamphlet on Vivisection that “Once the old Christian idea of a total difference in kind between man and beast has been abandoned, then no argument for experiments on animals can be found which is not also an argument for experiments on inferior men”.

The latest Anglican thinking is expressed in the Church of England’s Mission and public affairs council (2010) report to the Academy of Medical Science’s Call for Evidence on “Animals Containing Human Material” (hereafter “MPAC”). While not commenting generally on the use of sentient animals in experiments (or wanting to justify all such experimentation), it clearly draws the line at research on primates because of their “innate and recognisable ability for higher thought and emotion”. It recommended that “Research ought not to be permitted on born primates that may cause them pain, distress or significant loss of social interaction”.

The idea that non-human primates can simply be regarded as “animal models” would be theologically difficult for most Anglicans. At the very least they are fellow creatures and therefore deserve respect. Human “dominion” does not mean “despotism” rather that we are to care for other species as God would care for them. We are to act as responsible carers accountable to God. To think that we can sometimes make use of animals does not mean that they are all expendable for human use. As the Anglican Report *Man and Nature* (Montefiore 1975) insisted: “To imagine that God has created the whole universe solely for man’s use and pleasure is a mark of folly”.

The point is especially relevant when considering the status of specifically sentient beings (i.e., those beings capable of pain and pleasure). These are beings who have a capacity not only for pain, but also mental suffering including fear, stress, trauma, anticipation, terror and distress. We therefore owe such

creatures a duty not to harm them. This is derived theologically from our status in creation: our moral superiority should require us to acknowledge duties to them that they cannot acknowledge towards us. Being made in the image of a holy, just and loving God means that we should rather characterise ourselves as the “servant species rather than as the master species” (Linzey and Kramer 1995).

The conclusion from this theology is inevitably restrictive in relation to David’s work. The MPAC Report holds that research involving animals containing human material ought to continue to be permitted, but lays down such stringent conditions that it is difficult to see how such work could in fact be ethically continued. The conditions include not allowing cytoplasmic hybrid embryos to develop beyond 14 days; not allowing research if it may result in an animal with significantly enhanced cognitive functions characteristic of human persons; not allowing research if it may result in a live creature that contains such a mixture of human and animal material that it is difficult to determine its status; not allowing research if it is likely to lead to the formation of human germ-lines in animals; not allowing research that may give rise to an animal whose cognitive functions have been enhanced to a level where borderline personhood may be attributed to it, and research ought not to be permitted that involves animal embryos or fetuses containing human material being implanted in a human womb.

Other Anglicans would go further and maintain that it is intrinsically wrong to create hybrids in any form and that such interference constitutes a lack of respect for creatures, both human and animal. They would maintain that the “integrity of creation” as supposed by many church statements precludes such intervention. To the utilitarian argument that the ends justify the means, and that there may be benefits to this research, it would have to be replied that not everything that can be done should be done. It cannot be right to pursue even good ends by unethical means.

#### A Buddhist perspective

Lisa Kemmerer is a well-traveled philosopher-activist dedicated to working against oppression, whether on behalf of the environment,

nonhuman animals, or disempowered human beings. Her books include *Animals and World Religions* and *Sister Species: Women, Animals, and Social Justice*.

Buddhism teaches five basic precepts (laws or rules) by which to live, the first and most fundamental of which forbids killing living beings. This precept does not offer exceptions for selfish human interests—we may not kill for food, clothing, or hoped-for medical gains. A similar but more stringent moral imperative, *ahimsa*, forbids *harming* “any living being” (*Dhammapada* 74). The Buddhist “Dhammika” [*Sutta Nipata* 393 (see Fausböhl 1881)] connects the first precept with *ahimsa*, instructing Buddhists not to kill, not to cause to kill (for instance, purchasing products tested on animals or animal products), not to incite others to kill (supporting animal experimentation or factory farming financially or verbally), and not to injure any sentient being (including any exploitative use of others, such as for science, food, clothing, or entertainment) (Fausböhl 1881, 66). Whether a macaque in a lab or a hen in a cage, Buddhist philosophy honors all sentient beings—their interests in living and maintaining bodily integrity, and their interests in freedom from human exploitation and/or manipulation.

Karma (literally “action”) is also critical to Buddhist morality. Future lives are inevitably shaped by choices: Actions determine futures as surely as “the wheel follows the foot of the ox that draws the carriage” (Burt 1955, 52). Karma determines our future incarnations based, in part, on how our choices affect other living beings (including humans, chimeras, and fish). Karma highlights the importance of honoring the first precept and practicing *ahimsa*, and also holds the key to understanding species interpenetrability. Across billions of years of reincarnation, the *atman* (soul) transmigrates from one being to another. As a result, each individual has been every other entity’s mother, brother, lover, child, and best friend across time. For example, the *atman* in the chimera that David exploits might previously have been his dear old grandmother or his faithful dog. In a universe governed by karma and reincarnation, we cannot exploit other living beings while respecting parents, grandparents, or any other loved one.

Some are likely to argue that Alzheimer’s research is for a good cause, that such research respects life—especially elders—and is therefore well-intentioned

(good karma). The truth is that non-animal alternatives are less costly, more dependable, and do not directly cause suffering, and will therefore be the choice of any informed, sincere researcher. Furthermore, the nature of research is that outcomes are uncertain. It is therefore unconscionable to trade off on the very real suffering of nonhumans in the hope of some possible gain to humans. Still, Buddhist morality is not concerned with any of these truths, but rather with the moral imperative that we not harm or kill other beings—whether or not such harm or killing might bring benefits.

Others are likely to argue that human beings are not in the same category as other animals, and that a chimera is a special sort of being who also deserves separate consideration—a little less consideration than a full-fledged human being, but more consideration than nonhuman animals. Buddhist morality requires, most fundamentally, that we abstain from killing or harming *any* living being. Chimeras are living beings, as are chickens, pigeons, fish, mice, and deer. Buddhist teachings expose the shallow ego-centrism of those who believe that they and their kind are more important than others, and their kind. Such self-serving arrogance has no place in Buddhist morality. The Buddhist worldview does not envision human beings as separate and distinct—let alone above other animals. Through the process of reincarnation, a dog is a human is a mouse is a chimera. Buddhists offer the same moral protection to *all* sentient beings. Buddhist philosophy and morality would not have us protect a chimera because he or she is more human, but simply because we may not harm or kill any living being.

#### A Catholic perspective

John Berkman teaches moral theology at Regis College, University of Toronto. He writes on Thomistic ethics, medical ethics, and animal ethics. He has recently published “Are We Addicted to the Suffering of Animals? Animal Cruelty and the Catholic Moral Tradition” in *A Faith Embracing All Creatures* (Wipf and Stock 2012).

At its best, the Catholic moral tradition affirms that all animals (human and non-human) have intrinsic goodness. The primary purpose of all animals is to

glorify God in their being and flourishing. Human animals, having a rational nature, are *persons* with a particular dignity and a “right to life and physical integrity from the moment of conception until death.” (Catechism of the Catholic Church [CCC]1997, §2273) It is morally wrong to kill or seriously harm innocent *persons*.

The tradition has always understood that sub-personal animals have a secondary purpose of aiding persons. Thus, “[m]edical and scientific experimentation on animals is a morally acceptable practice if it remains within reasonable limits and contributes to caring for or saving human lives.” (CCC §2417) On the other hand, Catholics “must show [non-human animals] kindness”, can appropriately love particular non-human animals, and must “not cause animals to suffer or die needlessly.” (CCC §2457, §2418).

Since the *just* use of sub-personal animals requires serious purposes, experimentation on non-human animals may well be morally problematic if there are other means of achieving this knowledge. (see CCC §2457). Furthermore, since some kinds of animals (e.g. primate, cetaceans) can be expected to suffer more than others (e.g. some rodents or amphibians), creating chimeras with primates would appear more problematic than chimeras with rodents or amphibians.

We tend to think only of human beings as persons. However, since persons are creatures that by their nature have ‘rational’ qualities, other species (including chimeras) could be judged to be persons depending on their rational capacities. Thus, in creating a chimera (e.g. macaque with human brain tissue), determining whether it is a person would depend on an experiential evaluation of its rational capacities.

The Catholic moral tradition’s primary concern with human experimentation is that persons may be seriously harmed with no commensurate benefit to them (CCC §2295). However, for the love of God and neighbour, Catholics may undergo risks to their life and health. Thus, the tradition praises live organ donation as a noble form of self-gift if freely and authentically chosen by the donor, if done for the right reason, and if the potential good to be realized is commensurate to the potential sacrifice of the one undergoing experimentation.

While the authoritative Catholic moral tradition says very little about the morality of the creation of chimeras, the principles of the tradition can be brought to bear on key questions. First and foremost,

in considering whether to create and experiment on human-macaque chimeras, David must ask himself whether these chimeras would be persons? While one cannot definitively know until one understands the rational capacities of the kind of being created, this should be a major concern.

Even if he concludes that neither a macaque nor the macaque-human chimera is a person, the following questions remain:

Is the creation of these chimeras the only way to do this research work? The fact that it might be the least expensive or marginally superior to other approaches would not be a morally adequate response.

What other morally problematic practices might be required to create this chimera? For example, are the human neural cells obtained from the destruction of human embryos or by other means that the Catholic moral tradition rejects? If so, then David will need to consider the extent to which he is cooperating with (or in fact engaging in) wrongful acts, and consider stopping this work, either asking to be transferred to other work in the company or seeking work elsewhere.

Finally, if the plan involves experimenting on the chimeras, there should be a real sense of gratitude to them and legitimate regret for what they will undergo. This regret should be displayed in the kind of care given to them. Concern for their general welfare will include setting up an environment for them that allows them to otherwise (relatively) flourish in their captive state i.e. they should be kept in an environment that rivals (or betters) the very best zoos.

Ultimately, how the human-macaque chimeras should be treated cannot be separated from the question of their particular ends and purposes. As stated above, we cannot know the rationality of such chimeras (i.e. whether they are persons) until we are confronted with them in action. However, until we know, the appropriate principle from the Catholic moral tradition is one of giving such chimeras the benefit of the doubt, and giving them greater (as opposed to lesser) moral consideration. However, if it was ethical to create these chimeras (and I have raised serious doubts from the Catholic moral tradition), then such creatures should be given respect approaching that given to persons, until we have good reason to believe otherwise.

## A Confucian perspective

Dr. Zhen Cai is an associate professor of philosophy at East China Normal University, Shanghai, China. Her research interests include ethical issues in genetics, Confucian ethics, contemporary virtue ethics, and Kantian ethics. She has published a book on virtue ethics and contributed articles to various peer-review journals.

Confucianism is a long and complicated tradition, and it is somewhat dubious to talk about “the Confucian perspective.” I will mostly focus on the ideas of one influential Confucian thinker, Mencius.

For Mencius, human beings are not autonomous individuals that are human because of some inborn qualities (having a soul, having reason, able to suffer, etc.). Rather, “human” is a moral and social concept. Without proper human relationships (father and son, husband and wife, ruler and subject, etc.) and without certain virtues (compassion in particular), something that looks like a human cannot be properly called a human. Moral concern begins with the care for family members, and then should be cultivated toward others, animals, plants, and eventually everything in the universe. This care should be graded or differentiated. It is natural and justified that we care for those who are close to us more than those who are distant from us. This means that when both the potential benefits to humans and the risks of experiments on humans are high (such as the case of developing medicines for serious diseases), it is justified, according to Confucianism, to use animals and even to take their life for the purpose of humans’ well-being. But we as humans should also be compassionate toward animals. Thus, the animal experiments should be conducted in a serious and careful way that causes the least pain on animals and any arbitrary and cruel treatments of animals during the experiments are not accepted (Fan 2010). Indeed, if the benefit to humans is small, but the pain to animals is great, a Mencian can even object to experiments on animals.

When we turn to the specific case of experiments involving human–animal chimeras (HACs), the most disturbing part for David is that he considers these animals more or less “humanized” through the introduction of human stem cell. This presupposes that the human-ness somehow lies in those “human”

cells, and so their injection into animals makes these HACs somewhat human. But as was argued, for Mencius, to have biologically human cells doesn’t make HACs or anything else human. Even a biological human can be considered not-human if he or she doesn’t develop proper social relations and moral virtues. Moreover, for Confucians, our preferential treatment of humans is not necessarily based on the superiority of humans in mental capacities, but can be appealed to our natural tendency of associating with fellow humans. This natural association gives our fellow human beings more care than others (Tongdong Bai 2009). Furthermore, the moral status of different animals is not determined in terms of their innate capacities either, but their social and psychological association with humans. Those animals that have accompanied us as pets and labored for us deserve more concerns than those living in distance. Their close relationship with human beings renders them higher moral status. Wild animals, by contrast, are allowed to be hunted and eaten insofar as the regulations and restrictions on when and how to take them being followed. In this sense, a dog, as a pet, can have greater moral status than a wild chimp even though the latter is more intelligent and closer to human according to biological categories.

Given the above ideas, for the Confucians, having some human cells, and even having some innate mental capacities are not decisively relevant to moral status. In David’s situation, the sufferings of these HACs are significant to us, not because they will develop humanlike cognitive capacities, but because the expressions of their sufferings remind us of the similar kind of sufferings of our own.

Of course, there are limits on not treating HACs as humans even from a Confucian perspective. If HACs are made look like human beings and have the capacity of developing human relations and compassion, Confucians may consider using them for medical experiments problematic. Indeed, to experiment on them would be rather similar to experimenting on human beings—“human beings” in a Confucian sense.

## An Evangelical perspective

Karen Swallow Prior Ph.D. is Professor of English at Liberty University and a member of

the Faith Advisory Council of the Humane Society of the United States. She is the author of ‘Booked: Literature in the Soul of Me’ and a contributing writer for Christianity Today and The Atlantic.

Despite a spirit of activism across a range of issues, Evangelicals have been largely silent on the topic of animal experimentation and would thus be ill-equipped to advise David in his dilemma. Evangelicalism’s silence on animal experimentation is puzzling in light of the positions of prominent Evangelical leaders from the movement’s beginnings in the 1700s until the present day (Graham 2012; Wesley 1806). Instead Evangelicalism is influenced by long held Christian and social traditions which emphasize a categorical distinction between humans and animals: *imago dei* that sets humanity apart from the rest of creation; whereby humans are given dispensation to use animals under God. Intertwined with these secular philosophies are two biblically-derived views based on the Genesis account of creation, “dominion” and its more benevolent counterpart, “stewardship,” both of which view animals from an anthropocentric rather than theocentric perspective (see Linzey and Cohn-Sherbok 1997). In the absence of any coherent, unified Evangelical position on animal experimentation, elements of each of these views are usually found in Evangelical practice as, for example, in the emphasis on saving souls at the expense of creation care or opposing animal cruelty because of its *dehumanizing* effects, and because concern for animals is a Biblical mandate.

A theocentric view of animal/human relations would affirm the position of most Evangelicals that the *imago dei* is stamped in each human life at conception within the unique biological entity that will become an individual person (i. e., the zygote), not in an individual human cell such as sperm, egg, or brain cell. Thus, in the traditional Evangelical view, David’s insertion of human cells into an animal would not alter the moral status of the animal nor the ethical apparatus to be applied to its treatment. Indeed the destruction of human cells has negligible moral significance compared to the destruction of a bearer of God’s image. However, the creation of human–animal chimeras elicits several moral and theological questions as to the importance of human dignity.

A theocentric view of animal/human relations would not only uphold the biblical grounds for human

dignity, but could also alter Evangelical support for animal experimentation. Viewing animals in terms of God’s original purpose and design rather than in terms of how animals can be used for putative human gain would severely delimit animal experimentation, particularly human–animal hybrids. A theocentric view would not necessarily equate the gnat and the gorilla, but a view of their place in creation and the treatment each species deserves that is based on the relationship of each species to God rather than to humans would offer a paradigm shift with untold implications. It would uphold the Evangelical understanding of the creation account in Genesis. As one Christian bioethicist argues, chimeras raise a “fundamental Christian concern” by violating a “divinely created order” in which “plants, animals, and humans always reproduce after their own kind or seed.” Hence the creation of human–animal hybrids “runs counter to the sacredness of human life and man created in the image of God.” (Jones 2003) Further—and simply—just because science can do something doesn’t mean it should. Indeed the Biblical account of the world after the Fall prescribes the use of animals only for labor, clothing and food. Not only does the Bible not explicitly enjoin animal experimentation, but it explicitly commands kindness and compassion toward animals. An Evangelical approach to David’s dilemma that reflects the history of Evangelicalism and the primacy it places on scriptural authority would inform David that while the humanized animal is not a human being made in the image of God that must be treated as such, animals were *not* created by God to suffer in humanity’s stead.

#### A Hindu perspective

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Hinduism does not have a unified system of beliefs, but is rather an umbrella term for a variety of religious traditions. At the heart of Hinduism are not

individual human rights, but the concept of *dharma*, the universal principle of law, order, harmony and truth. The purpose of *dharma* is not only to attain a union of the soul with supreme reality; it also suggests a code of conduct that is intended to secure worldly happiness and harmony. The question then is whether animal experimentation and the creation of interspecies constructs are *dharmic*.

Hindu scriptures teach that there is a fundamental oneness of all living beings, and that all beings possess souls which are eternal. All living beings, regardless of their physical form, are *atman*, individual units of consciousness. Causing suffering to any living being is therefore the greatest offence (Chapple 1993). Similarly in Hindu theologies all sentient beings move through multiple (re)births and deaths, influenced by their past ethical actions. According to their *karma*, humans can be reborn as animals and animals reborn as humans. Consequently it is the duty of humans to avoid species discrimination, and to cultivate a feeling of kindness and love for all living creatures. Thus for many Hindus allowing all sentient beings to live out their *karmically*-determined lifespan is critical. The doctrine of *ahimsa* (non-violence) also encourages humans to treat animals well, and leads many to regard their instrumental use as ethically unacceptable. Hindus who support a version of creationism share uneasiness about the transgression of species boundaries and in particular the replacement of animal neurons by human neurons. They argue that the creation of human–animal hybrids is ‘playing God’; that it goes against the divine will, ‘nature’ and genetic integrity, creating moral, spiritual and biological confusion.

These are powerful ethical arguments against animal experimentation of any kind, and many Hindus would argue that the pursuit of even good ends by unethical means is wrong. Nevertheless David’s dilemma is not resolved so simply. While Hindus accept that all living beings have souls, most discriminate in practice between the moral statuses of different species; there is an assumption that some animals are more spiritually evolved than others. Research which aims to develop a new type of primate model by injecting an increasingly large dose of human neural stem cells into macaque embryos might be seen as more problematic than experiments involving dogs, rats or mice, but less problematic than research involving cows. Moreover, Hinduism

might be better able to cope with the humanisation of chimeras than some other religions, because there is some fluidity between human and animal categories. From early childhood Hindus are familiar with the idea of divine chimeras as the examples of Ganesha, Hanuman and Narasimha show.

While many Hindus accept that the most fundamental guideline for conduct is the prohibition against the bringing of harm and/or death to any living being, on the whole Hindu tradition supports advances that enable humans and other animals to flourish. Proponents therefore argue that the most important advances in modern medicine would not have been possible without animal experimentation, and justify such experimentation ethically as offering to both human and other animals a better quality of life.

In Hinduism what might be called situational ethics, the importance of time, place, circumstance and person in ethical choice, can never be underestimated. What is *dharma* in one set of circumstances becomes *adharma* in another. Thus in the 21st century the possibility of mitigating the enormous burden of suffering caused by Alzheimer’s or Parkinson’s disease, will be an important consideration for Hindu theologians and ethicists as well as for the scientists and technicians burdened by the ethical dilemmas their research involves.

If we consider David’s dilemma we see that the appeal to the positive consequences in terms of scientific and therapeutic applications is the strongest argument in favour of research on chimeras. Advocates see the production of life saving technologies and the development of solutions to important global health problems as justifying their creation. In the final analysis therefore the unsatisfactory answer to David’s dilemma for many Hindus may be that each human being has to weigh up the ethical possibilities and *karmic* outcomes in the light of religious and philosophical reflection and make the final decision for themselves.

#### An Islamic perspective

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Like other world traditions, Islam encompasses many views on the question of animal experimentation. Considering the limited scope of this article and the fact that the Qur'an and the Ḥadīth (Prophetic tradition) are generally considered the main sources of authority in Islam, I will limit my discussion mostly to a reading of these two texts. The Qur'an and the Ḥadīth do not address the question of animal experimentation directly, but their general position on nonhuman animals can inform this debate.

Both the Qur'an and the Ḥadīth allow Muslims to derive benefits from many animal species. Most notably, Muslims are allowed to kill certain animals for food, to consume many animal products, and to use camels and equines for transportation. On the other hand, both texts impose numerous restrictions on these uses. From the Ḥadīth's insistence on animals' welfare, Muslim jurists derived the principle of animals' "*ḥurma*," or inviolability, which translates into a set of God-given rights that nonhuman animals have against their owners, and, for that matter, against humanity at large. With the exception of the sanction to kill animals for food, there is one shared underlying principle: humans may derive benefits from other animals *provided that these benefits do not conflict with animals' interests*. Muslims have duties toward domestic animals, including the obligation to feed and protect them from danger. Thus, the main rule that seems to govern the human-nonhuman animal relations, at least according to certain Islamic textual sources, is that of mutual benefit and exchange of services, founded on the principle of respect for and inviolability (*Ḥurma*) of animal's wellbeing.

Considering this emphasis, even the permissibility to kill certain animals for food can hardly be interpreted as prioritization of humans' interests; rather, it appears to fit within a larger ecological worldview. Humans are simply one among other species that are allowed to consume meat and be part of the ecological fabric. It should be noted also that the Ḥadīth stresses that animal slaughter be performed in the least painful way possible (both physically and psychologically), and that the name of God be pronounced upon killing an animal.

In view of the above, it is reasonable to conclude that animal experimentation can hardly be justified by

Islamic teachings, since it conflicts with nonhuman animals' interests. Two points provide further substantiation to this view. First, when the Prophet was once asked about the possibility of using a frog for medicinal purposes he did not allow such use (Abū Dāwūd 1952, 3873). Second, the Qur'an is critical of those who "alter God's creation" (Q.4:119), a statement that has often been read in relation to animals, for example, as implying the prohibition of animal castration. If one can apply this verse to castration, it is difficult not to see it as applicable to chimeras.

Some Muslims may find an Islamic justification for animal experimentation in the principle of "*mas-laha*", or (human) Public Good. In fact, the Ḥanafī school of jurisprudence often applied this principle to expand humans' privileges and allow many uses of animals which, strictly speaking, seem to contradict the teachings of the Ḥadīth. It is not my position to evaluate this standpoint. I would however encourage David, and, for that matter, any Muslim, to acquaint themselves with traditional Islamic teachings on animals. David's concerns, in fact, are deeply anthropocentric. Chimeras seem to matter to him only because they are "humanized." This position is at odds with the level of recognition and attention Islamic tradition has historically shown to the interests of nonhuman animals. David, however, is hardly unrepresentative of modern Muslim views. This is in part due to major changes in educational systems in the Muslim world, whereby exposure to traditional knowledge has become limited whereas the ideals of modernity have often been accepted unquestionably.

Respect for nonhuman animals' welfare should not be interpreted as a stand against scientific research, of course. A cursory survey of Islamic history reveals great dedication to scientific knowledge. These Ethical restrictions should rather be interpreted as an incentive to think more creatively, so that one species' happiness does not come at the cost of other species' wretchedness.

#### A Jewish perspective

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The Torah contains laws demanding that we minimize pain to animals. For example, we may not yoke a donkey and an ox together (Deuteronomy 22:10), for that would put tremendous physical strain on the donkey, and animals are to be allowed to rest on the Sabbath day (Exodus 20:10). The Torah even forbids causing animals psychological pain, as, for example, when it prohibits the muzzling of an ox working on the threshing floor (Deuteronomy 25:4), for then he would constantly see food that he could not eat. The Rabbis summarized that concern in their blanket principle of *tza'ar ba'alei hayyim*, that we may not cause pain to animals unnecessarily.

At the same time, a fundamental value of the Jewish tradition is that we preserve human life. In fact, a Jew not only may, but must violate all but three of the Torah's commandments, if necessary, in order to save a person's life. This is ultimately based on the Jewish conviction that our bodies belong to God. We must therefore avoid undue risk and engage in behaviors of proper diet, hygiene, exercise, and sleep in order to preserve God's property. Thus, even though the Jewish tradition very much respects and tries to protect animals, it sees them as created by God for the service of humanity. Some human uses of animals are morally questionable, such as slaughtering elephants for their tusks or using animals to perfect cosmetics, but experiments using animals to advance human health are both permissible and preferable to using humans for such experiments. Moreover, if one can conduct experiments using only animal tissues rather than full animals so that the animals need not be killed or adversely affected, that would be even better. The common practice of testing therapies on animals before trying them out on humans, though, is exactly what the Jewish tradition would advocate.

The Psalmist says, "How many are the things You have made, O Lord; You have made them all with wisdom; the earth is full of Your creations" (Psalms 104:24). This expresses admiration for each of the various species God has made, with no hierarchy of value among them—except for humans, who are, according to Genesis (1:27; 5:1; 9:6), uniquely created in the image of God. This special status permits us to use animals for our purposes, with some

restrictions. One set of such restrictions are the dietary laws. These limits on eating animals, though, do not apply to using any nonhuman animals to devise cures for human diseases, for the mandate to cure supercedes the dietary laws. Still, because of the requirement that we not cause undue pain to animals, animals whose neurological structures are more primitive and thus experience less physical and psychological pain are preferable for use in experiments.

The Torah prohibits mixing various kinds of seeds and animals: "You shall not let your cattle mate with a different kind; you shall not sow your field with two kinds of seeds; you shall not put on cloth from a mixture of two kinds of materials" (Leviticus 19:19; see also Deuteronomy 22:9, 11). The concern here seems to be to preserve the order of nature, with each species distinct from the other.

Rabbis, though, have generally maintained that the mandate to cure disease supercedes these laws. Thus an opinion unanimously approved by the Conservative Movement's Committee on Jewish Law and Standards, says this:

Much good can be derived from this ability to alter flawed genes to eliminate malformations and overcome disease... Thus the ability to create transgenic animals who bear or lack traits that mimic human diseases has enormous potential for research.... Judaism's emphasis on healing individuals who are sick is likely to override any combination of concerns that might otherwise impact the technique. (Reisner 1997)

The bulk of Rabbi Reisner's ruling concerns whether Jews are permitted to eat foods made with altered genes, which he ultimately permits. As quoted above, however, he notes that even if they were not kosher for general consumption, they may be used to cure. Clearly, David should seek to cause as little pain to the research animals as possible, but with that done, he should engage in the research without moral reservation.

## Discussion

Religious traditions are sets of beliefs about the causes, order and purpose of the world that, except

for the Taoic traditions, make reference to God(s) or other divine beings. Religious thought is the prism through which people of faith view the world. It provides a source of meaning and a moral code that is central to the construction of their views on issues of scientific and moral importance. People's faith shapes their attitudes towards and decisions about the nature, purpose and ethical implications of human–animal chimera creation, and other types of research involving chimeric organisms. Moreover religious discourse can confer moral legitimacy on actions and practice. In this way the commentaries above provide knowledge of the ideal ways acting and ideal reasons for acting in relation to David's Dilemma. The positions articulated above are personal prescriptions. They are drawn from the religious teaching and traditions our commentators found to be most pertinent to the problems faced, and not an attempt to represent the faith tradition in general. They do not attempt to describe a typical perspective or even describe the full breadth of perspectives regarding chimeric research within their faith tradition. In regard to this, most commentators were careful to emphasise that there is no consensus within their faith traditions on the moral propriety of animal experimentation. Religions are internally diverse, rather than homogeneous, especially when it comes their positions on non human animals (Waldau 2000). This intrinsic diversity is an asset, as there is much we can learn about public perspectives on chimeric research by exploring the approaches taken to the central ethical issues within these different systems of religious thought. Indeed, as biomedical research increasingly becomes a global enterprise, those charged with regulation must be cognizant of how differences in religious positions on research involving human–animal chimeric organisms might influence and frame attitudes and beliefs about its practice.

There is a clear divide between the Abrahamic and Eastern (Dharmic and Taoic) religious traditions as to the relevance of species to moral status.<sup>5</sup> However, aside from issues surrounding concepts such as *imago*

*dei*<sup>6</sup> and the chain of nature, there is a plurality of views expressed in the commentaries, and many of these cannot be neatly categorised on the basis of common origins and foundational tenets. For example most commentators offered qualified disapproval for the practice of chimeric research—and half of them found grounds to reject the specific practices described in our vignette. Only one of the commentaries contains an unqualified rejection of the moral permissibility of David participating in chimeric research.

It is notable that all of the commentaries direct attention to the potential pain and suffering experienced by the animal as a consequence of experimental practices. All of them emphasise that pain in nonhuman animals is of great moral importance, and, if experimentation was to proceed, must be mitigated and minimised as matter of urgency. Notably the Jewish and Confucian commentaries give a strong mandate for chimeric research if it advances some valued human end such as human health. While also noting the importance of furthering these types of public goods, on the issue of whether human need authorizes chimeric research the other commentaries are either heavily qualified or ambiguous. For example, for most Muslims the permissibility of deriving benefit from nonhuman animals also depends on the possibility for mutual benefit, such that the action or practice is not in conflict with the interests of the animal. Other commentators sought to emphasise that the moral permissibility of creating a grafted chimeric organism rests not only on the utility of the research, but also the animal's capacity to be harmed and the amount of respect with which it is treated.

In regard to the above, all of the commentators indicate that a sincerely held attitude of respect for a chimeric organism could preclude its creation and use for human purposes. Indeed the 'strong' protectionism underpinning the positions of the Anglican and Catholic commentators requires that any such creature should be given special consideration—to the extent that they are treated as full moral person until we have grounds to believe otherwise. However the

<sup>5</sup> Moral status is a concept that describes what an entity is owed by its own right, and not as a product of its instrumental value to others.

<sup>6</sup> *imago dei* is a theological doctrine that human beings are created in the image of God, which gives us a special status in creation and the ability to actualize unique qualities such as spiritual self awareness and a capacity for moral reflection and growth.

two moral traditions differ as to what this protection requires. The Anglican position is that prenatal human–animal chimeric embryos must be destroyed before they acquire basic capacities. Whereas, the Catholic position is that the very the creation of human–animal chimeras using embryonic stem cells is a moral wrong. But should the research go ahead, then, according to the Catholic Bishops' Conference of England and Wales (2007), this concern also entails that any embryo with a preponderance of human genes should be considered a human embryo, and not discriminated against should its human mother wish to have the embryo implanted with the intent to carry the child to parturition.

The moral status of the chimera and the basis of moral authority are the points on which the religious commentaries differ most markedly from each other. For example the commentaries from the Taoic traditions both emphasise that moral status and moral authority are functions of relational ties, and, therefore, chimeric organisms have no greater moral importance than any other animal. However, the types of relationships emphasised are different, and so is their normative impact. The Confucian position is that humanisation is contextual whereby the acquisition of 'human relationships' is an essential element of being and gives a higher moral standing. Care for the other is 'graded and differentiated' on the basis of the social distance between living entities. From the Buddhist perspective the moral standing of sentient life is innate rather than contextual. At its foundation, Buddhist philosophy gives fundamental importance to absolute "eternal forms" that assign non-human animals full moral standing, making no exceptions for human interests. All living creatures share a common history, telos and emotional life rooted in a shared 'createdness'. Instead of measuring the moral worth of each individual, Buddhists believe we should treat all beings as our near relations, as 'one', and as such equally morally considerable.

Even with their emphasis on scriptural authority, relationships are also central in the Abrahamic faith traditions because of their belief in the elevated position of humankind in God's creation. There are, however, differences in how our relationship with God, each other, and other animals should influence human actions. For example according to the Catholic and Anglican moral traditions, the biological

'humanness' of any human–animal chimeric embryo is a central moral consideration—while the Islamic, Evangelical and Rabbinical position is that a primate chimera derived from human stem cells does not directly entail the potential for humanisation.<sup>7</sup> The point on which all of the commentaries from Abrahamic faiths agree is that the 'animality' of the chimera is of some moral importance. The Rabbinical, Catholic and Anglican, Islamic and Evangelical commentaries all invoke a concept of stewardship as a guide for how humans should regard and treat other animals—we should care for other species as God would care for them. The Hindu position is somewhere in the middle of all the positions described above. Hindu belief systems deem some animals to be more spiritually evolved than others. These qualities individually and collectively influence the moral status of the living being. Therefore the social and scientific context of experimentation, the organism's biological identity and its place in the hierarchy of creation could all be considered pertinent to the chimera's moral status and the normative case to accept or reject proceeding with the experimental research.

What most of the religious commentaries share with bioethical critiques of the type of research described in the vignette is the prominence given to two interrelated concerns: (1) that creating entirely new types of animals using reproductive technologies goes against a natural or divine order; and (2) that humanized prenatal chimeras are potentially an affront to human dignity. The first objections is founded on the tenet that there is an organization and direction to nature. Chimera creation is framed as a violation of a morally significant boarder that separates and differentiates the human from the animal. For the Abrahamic faith traditions, Confucianism and some schools of Hinduism, species difference is the foundation of moral meaning. In regard to this, most bioethicists now largely discount the threat of chimeras to natural categories (Haber and Benham 2012; Robert 2006), yet for many of our commentators the integrity of creation is of great moral importance. At the risk of over-simplification, this

<sup>7</sup> According to some Judaic scholars, the Talmudic and halakhic literature suggest that being born or formed by a woman is the primary criterion that defines human beings. See: (Loike and Tendler 2008)

difference is construed through their respective conceptions of the place of humans in nature, and the limits this places on human agency.

The second objection is based on the assumption that beings with ‘human’ capacities should be uniquely valued. Under this view the creation of human to animal chimeras unsettles what it means to be human; traditional distinctions between human and animal cannot be sustained. Yet Buddhists, Mencian Confucians, and some schools of Hindu thought appear to be more egalitarian than the alternatives. Each to a greater or lesser extent emphasizes the ‘oneness’ of all living beings. It is around the issue of human dignity that many bioethicists and people of faith are likely to find common ground, although their arguments are likely to rest on different sets of metaphysical commitments. The major point of difference is that bioethical arguments about whether the concept of ‘human dignity’ is morally relevant now tend to centre on the grounds by which such distinctions are maintained (Haber and Benham 2012; Melo-Martín 2008; Streiffer 2011). Indeed the diversity of approaches that can be taken on this issue alone, through both secular and religious systems of thought, might account for some of the divisions in public opinions about transgenic research seen in pluralist societies such as the UK and USA.

### Practical implications

Based on the commentaries above, the authors offer the following points as a summary for policymakers and researchers who seek a better understanding of religious perspectives on research involving engrafted embryonic human animal chimeras:

- Prenatal chimera creation and research are likely to be highly morally problematic for many people of faith
- Chimeric research is conditionally supported by the Confucian and Jewish faith traditions but support is heavily qualified within Evangelical, Anglican and Catholic thought. The position of Islamic, and Hindu faiths is ambiguous and contingent upon which of several criteria is deemed most important.
- The potential for human good such as human health and well-being is necessary but not sufficient to ensure conditional support for chimeric research.

- The species of non human animal used to create a human–animal chimera is significant to the moral permissibility of the practice for all but the Confucian and Buddhist traditions.
- Objections to transgenic research on the basis of ‘human’ or ‘species’ dignity are shared by bioethicists and most faith traditions, but not by Confucianism and some schools of Hindu thought.
- Public support for transgenic research could be more robust if researchers seek to address religious perspectives on the moral status of animals and the moral significance of the integrity of creation.

Finally, what the authors found to be most striking was the prominence given in most of the commentaries to scientific findings, concepts and methods. This suggests that far from being anti-science, scientific discourse informs religious systems of thought, and, potentially vice versa (Waldau 2000). Rather than being resistant to progress, the benefits of science are well recognised. Indeed many of the commentaries are imbued with a highly progressive attitude that holds the advancement of scientific knowledge as being a public good for which other moral compromises could, and, in some cases, should be made. That is not to say that ‘anything goes’. Set against such utilitarian impulses all of the contributors agree that many animals warrant respect and at least something in terms of direct moral concern in the way we care for them. Attention to each animal’s welfare, and the relief and prevention of pain in particular, is the key value shared by the faith traditions, as it is in most philosophically informed arguments.

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